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ABSTRACT

This Kamehameha Early Education Program (KEEP) report presents a comparative study of the work rates of kindergarten and first grade children in two classroom environments: a learning-center and a study-carrel environment. The subjects, seven matched pairs of kindergarten and first grade students, were chosen on the basis of the results of a diagnostic arithmetic test. The children were divided into two groups (Group A and Group B) so that the cumulative scores of both groups were equivalent. In phase I of the experiment, Group A was assigned to the study-carrel situation, and Group B to the learning-center. In phase II the working conditions for both groups were reversed. The procedure involved an experimental math period comprised of two parts: the instruction period, when all children were present, and the work period, when the groups were assigned to their respective settings. Both groups were tested after 13 days of the experiment at the end of phase I, and after another 13 days at the end of phase II. Data on individual children included the number of problems completed, the number completed correctly, and the percentage completed correctly. Results indicated that for these KEEP children, differences between a socializing setting (learning-center) and a socially restricted setting (study-carrel) were not associated with differences in either rate of work or learning achievement. (CM)

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The Kamehameha Early Education Program

The Kamehameha Early Education Program (KEEP) is a research and development program of The Kamehameha Schools/Bernice P. Bishop Estate. The mission of KEEP is the development, demonstration, and dissemination of methods for improving the education of Hawaiian and Part-Hawaiian children. These activities are conducted at the Ka Na'i Pono Research and Demonstration School, and in public classrooms in cooperation with the State Department of Education. KEEP projects and activities involve many aspects of the educational process, including teacher training, curriculum development, and child motivation, language, and cognition. More detailed descriptions of KEEP's history and operations are presented in Technical Reports #1-4.

Abstract

Following the discovery that a low rate of working time spent occurred in learning-center environments (see Technical Report #17), it was shown that KEEP children's highest-probability response in such an environment was talking to each other.

In an effort to determine whether blocking of this response would result in higher work rate, a study was undertaken in which work rate was compared between learning-centers and carrels. The carrels effectively isolated each child during arithemetic drill work.

Although the children working in the carrels produced extremely high rates of work, once the teacher (who was capable in classroom management) instituted strong instructions and reinforcement for learning-center work, both groups achieved high rates and did not differ.

Very effective teachers can achieve work rates as well in an open environment as in carrels; however, study carrels may be useful for drill work when there are too few teachers present in the classroom, or when management of the children is a problem for the teacher.

Technical Report #18

Learning Center and Study Carrels:

A Comparative Study

Sherlyn Chun Gisela E. Speidel Roland G. Tharp

Technical Report #17, "A Study of Time Spent Working in Learning Centers," reported a disturbing fact. In even the most efficient learning-centers, rates of work-behavior (of KEEP children), were only about 25 percent. During three-fourths of learning-center time, the children were doing something other than their assigned work.

We believe, after the earlier study, that much of the children's non-working time is an inevitable problem of learning-centers; it is spent on arranging materials, preparing for work, waiting for something, etc. But, are learning centers particularly problematic for our KEEP children?

Mostly the children are socializing. Hawaiian-American children are notable for their sociability, and it is possible that the open environment of the learning-center room, with its ready access to other children, actually encourages chatting and visiting. In this way, the children's highest-probability response (socializing) would interfere with their less-likely behavior of school-work.

Thus, KEEP children might be less efficient in learning-centers than other, less sociable children.

The earlier study left one major question unaddressed: Does this low work rate, and all this socializing, interfere with learning? Or, is it possible that the informal, sociable atmosphere actually enhances acquisition and retention? The present study is designed to study these problems.

Work-rate and retention were measured under two very different systems of classroom organization: first, in a learning-center environment; and second, in a study-carrel environment which blocked the children's socializing by dramatically restricting their access to one another.

METHOD

Subjects

Out of a class of 20 kindergarten and first grade students, seven matched pairs were selected on the basis of the 15 highest scores of diagnostic arithmetic test results. One of the 15 children in this high group was eliminated since no matching partner was available. The remaining five children were excluded because their scores were considerably lower than those of the rest of the class. Scores for the top 15 ranged from 75 to 107, with no more than six points between any two consecutive scores, while the highest score of the bottom five was 15 points lower. Eight boys and six girls constituted the group of 13 kindergarteners and one first grader. None of the children had any special learning or emotional problems.

After obtaining the seven matched pairs, an effort was made to divide the children into two groups in such a way that the cumulative score of each group was equivalent. Then, by flipping a coin, one group (Group A) was assigned to the study carrel condition, the other (Group B) to the learning-center condition. The six extra children were kept in the math class to create a situation that would more closely approximate a typical learning-center milieu for Group B: in a regular learning-center setting, a teacher usually has to monitor a class of 28 children. In phase 2, the conditions were reversed for the two groups: Group A was assigned to the learning-center condition, Group B to the study carrel condition.

The Setting

The cubicles were constructed of plywood 3/5 inches thick. All three walls were 48 inches high; the side walls were 37 inches deep and the front wall was 25 1/2 inches wide. The desk area was built into the cubicle and was 20 inches from the ground and 15 inches deep. The cubicles were built to isolate a child well within the walls of the cubicle. Sideway glances only showed him the blank wall. If the child turned around to look, he would see the blank wall of the room three feet away. If he looked up, he would see the ceiling.

The circular table at which the children in the learning-center condition sat was 48 inches in diameter and constructed of formica. There were no divisions of any sort between the children. The table stood in the center of the classroom within full view of the teacher (except when the teacher bent down inside a cubicle to help an experimental child) and also within full view of the 6 nonexperimental children. The teacher, who was also the children's regular classroom teacher for part of the day, acted as the experimenter.

Procedure

The experimental math period comprised two parts: the instruction period and the work period. Instruction was given to the entire group at once, including the 6 nonexperimental children. During the instruction period, the children usually sat at tables or on the floor in front of an overhead projector, chalkboard, or screen. The session generally lasted from 10-15 minutes. On the first day of the experiment, at the end of the instruction period, the experimental teacher told the children: "Before I give you your hard work to do, I would like to tell you about something different we will be doing. How many have worked in the cubbies before?" (In order to adapt the children to the carrels, all of them had worked for a brief period in them at

some time prior to the experiment.) "Yes, all of you have and all of you will be working in them again at different times. I'm going to divide you up into two groups and one group will use the cubbies (carrels) part of the time and the other group, the other part of the time." (The teacher then divided up the children seemingly at random.) "Today and for the next couple of weeks, this group (Group A) will use the study carrels, the others of you will work at the tables as usual. When you get your papers, do as many problems as you can. I don't expect you to do them all. I'm going to set this timer and when it rings, I would like you to stop working and put your pencil down. Then, we will either play bingo or some other fun math games. I will help you if you need help; please raise your hand if you want some help. If I am busy, please go on to other problems or pages and I will come when I am free. Do not get out of your seats."

The teacher then handed out the pages, more pages than the children could complete within the time limit of approximately 20 minutes. These work pages contained arithmetic drill problems which drew upon that day's instruction-period teaching. As Group A went into the study carrels, the teacher placed the 7 Ss in Group B at one round table and the 6 nonexperimental children at another table. She then set the timer and said "go."

During the 20-minute period, the teacher circulated the classroom, assisting children. The teacher carried a tally sheet containing each child's name, and recorded each time a child was helped. The teacher used the tally sheet to insure that neither group A nor B, received more assistance. Generally, the teacher would go from child to child helping each one whether hands were up or not. Answers were never given.

When the timer rang, the teacher said, "Stop, put your pencils down," and, immediately, with student help, started picking up all papers which had names

entered prior to distribution. Group A left their study carrels and came to the main area of the classroom while materials were collected. The class then played bingo or a similar activity until the end of the math period, approximately 10-15 more minutes.

The teacher used typical behavioral management techniques. Praise statements and prompts were either directed at individual children or at the entire class, never to Group A or Group B alone. When praise was directed at an individual child, a tally mark was recorded for the group the child was in, so that by the end of the period, the same number of individual praises were given to each group. Statements of encouragement were frequently directed at the class to keep the children working quietly and quickly.

The teacher checked the children's papers after each class. The next day, before the main instructional period, the children usually corrected the errors of their previous day's work. Occasionally, the children were asked to make the corrections on their own as homework. On days when many errors were made by the majority of children, the teacher did not return the papers to the class, assuming that the initial instruction had not been clear. The concept was then retaught and pages with similar problems were given again.

Testing

After 13 days of the experiment, the children were given two different tests. The first test, Test 1, was administered identically to the original diagnostic test: in both administrations the test was not timed and was given individually. After administering Test 1, a difficulty appeared: the untimed nature of the test produced high scores with a restricted range. These data are reported in Table 3.

It was observed that the children would obtain high scores by using their fingers for difficult problems. Furthermore, the individual test administration

was time consuming and did not resemble the regular class situation. Therefore, Test 2 was administered; it was timed and administered to the entire group at once. To prevent copying, cardboard dividers were constructed and placed on the tables at which no more than 2 children sat. The nonexperimental children were excluded from testing. Data from Test 2 are reported in Table 4.

Reversal

Following posttest administration, a three-week break was taken, (necessitated by the absence of the experimental teacher.) No new concepts were introduced and no children worked in the study carrels. Many days were spent in just playing math games or bingo.

Subsequent to this interruption, reversal of the two conditions was introduced. During reversal, the same procedure was used except that Group A was placed at the round table and Group B was placed in the study carrels. The pairs remained the same, although by this time, their performances were perhaps no longer correlated. The six nonexperimental children remained at their original table. This reversal condition was conducted for the same number of days, 13, and, upon conclusion, a final test, Test 3, was administered. Again, this test was timed and administered to the entire group at once, with the exception of the nonexperimental children.

Dependent Variables

Each child's work was corrected daily and the following informaiton recorded: 1) the number of problems completed, 2) the number of problems completed correctly, and 3) the percentage of problems completed correctly. The data were further tabulated in daily totals and averages for Group A and B. At the end of each phase, the totals and averages on all three categories were computed for each individual and for each group.

To assess the amount of learning that had occurred in each phase for each group, Test 2 was administered after Phase 1 and Test 3 after Phase 2. Number of problems completed, number completed correctly, and percentage of problems correct were recorded.

RESULTS AND DISCUSSION

Table 1 shows the average daily performance during Phase 1 for each S and for each group on the three measures. Group A achieved, on the average, 5.19 more problems correct than did Group B. Sandler's A test for matched groups (a modified version of the t test), did not find the difference significant. Furthemore, no differences were found between the two groups on mean number of problems completed or mean percentage of problems correct.

Table 2 shows the results of the second phase. Again, the two groups did not show a significant difference in any of the daily performance measures.

The results of the performance of the two groups on Tests 2 and 3 can be found in Tables 4 and 5. One notes that in both phases, children in the study carrel completed more problems correctly, although not significantly so.

Figures 1-4 are graphic representations of the individual performance of the pairs of Ss in the two phases. Individuals of each pair will be designated by group and pair number, i.e. A2 is the individual from Group A of the second pair. By inspection, one can see the reason for the lack of statistical significance. Several pairs differ greatly in their performance in Phase 1. Pair 3 shows the largest difference in both number of problems correct and number of problems complete. Individual B3 was absent frequently; although B3 comprehended the concepts, he was not able to develop speed through practice. Pair 7's differences may probably be attributed to B7 "tuning out" instruction for some unknown reason. Eventually B7 got so far behind in concept development

TABLE 1

Average daily performance during Phase I for each subject and each group on the number of problems correct, the number of problems complete, the percentage of problems correct, and the difference between the pairs on the mean correct.

Group A	Number days present	Mean Correct	Mean Complete	Percentage mean correct, mean complete	Group B	Number days present	Mean Correct	Mean Complete	Percentage mean correct, mean complete	Difference of pairs on mean correct
S_1	13	68.92	73.08	94%	S_1	13	62.54	63.92	98%	6.38
S_2	11	30.45	31.91	95%	S_2	13	65.38	67.77	96%	34.93
S_3	12	88.75	99.83	89%	S_3	7	12.29	13.14	94%	76.46
S_4	12	42.92	47.08	91%	S_4	11	39.91	40.73	98%	3.01
S_5	10	32.10	39.60	81%	S_5	12	36.17	39.42	92%	4.07
S_6	13	28.46	35.00	81%	S_6	13	71.54	75.15	95%	43.04
S_7	9	62.56	70.33	89%	S_7	12	11.92	14.08	85%	50.64

TABLE 2

Average daily performance during Phase II for each subject and each group on the number of problems correct, the number of problems complete, the percentage of problems correct, and the difference between the pairs on the mean correct.

Group A	Number days present	Mean Correct	Mean Complete	Percentage mean correct, mean complete	Group B	Number days present	Mean Correct	Mean Complete	Percentage mean correct, mean complete	Difference of pairs on mean correct
S_1	12	52.83	59.25	89%	S_1	12	56.42	57.92	97%	3.59
S_2	8	25.25	28.13	90%	S_2	13	59.69	78.31	76%	34.44
S_3	13	38.62	50.08	77%	S_3	8	19.63	24.50	80%	18.99
S_4	12	34.67	42.00	83%	S_4	13	46.38	48.46	96%	11.71
S_5	11	43.09	48.27	89%	S_5	11	25.55	35.00	73%	17.54
S_6	13	47.54	52.69	90%	S_6	13	60.00	66.85	90%	12.46
S_7	12	52.25	62.00	84%	S_7	13	17.31	23.54	74%	34.94

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TABLE 3

Results for Test 1 for each subject and each group

Group A	Correct Pretest	Correct Posttest	Difference	Group B	Correct Pretest	Correct Posttest	Difference
S_1	107	112	5	S_1	106	110	4
S_2	101	109	8	S_2	100	112	12
S_3	93	112	19	S_3	93	109	16
S_4	87	111	24	S_4	90	113	23
S_5	86	105	19	S_5	85	103	18
S_6	81	110	24	S_6	81	103	26
S_{10}	75			S_7	75		

TABLE 4

Results for Test 2 for each subject and each group

Group A	Correct Posttest[2]	Complete Posttest[2]	Percent Correct, Complete	Group B	Correct Posttest[2]	Complete Posttest[2]	Percent Correct, Complete
S_1	116	119	98%	S_1	53	54	98%
S_2	59	67	88%	S_2	94	101	93%
S_3	84	95	88%	S_3	20	24	83%
S_4	68	74	92%	S_4	81	85	95%
S_5	51	53	96%	S_5	52	59	88%
S_6	45	48	94%	S_6	133	136	98%
S_7	91	95	96%	S_7	7	32	22%
Total	514	552	6.51	Total	440	491	5.775
Mean	73.43	78.86	93%	Mean	62.86	70.14	83%

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TABLE 5

Results for Test 3 for each subject and each group

Group A	Correct Posttest[3]	Complete Posttest[3]	Percent Correct	Group B	Correct Posttest[3]	Complete Posttest[3]	Percent Correct
S_1	72	90	80%	S_1	60	65	92%
S_2	32	40	80%	S_2	87	100	87%
S_3	49	93	53%	S_3	26	29	90%
S_4	35	41	85%	S_4	39	46	85%
S_5	37	50	74%	S_5	31	42	74%
S_6	42	55	76%	S_6	66	84	79%
S_7	39	58	67%	S_7	22	28	79%
Total	306	427	72%	Total	331	394	84%
Mean	43.71	61.00		Mean	47.29	56.29	

18-12

Figure 1a

Phase I - Cubicle Study (Group A in Cubicles)

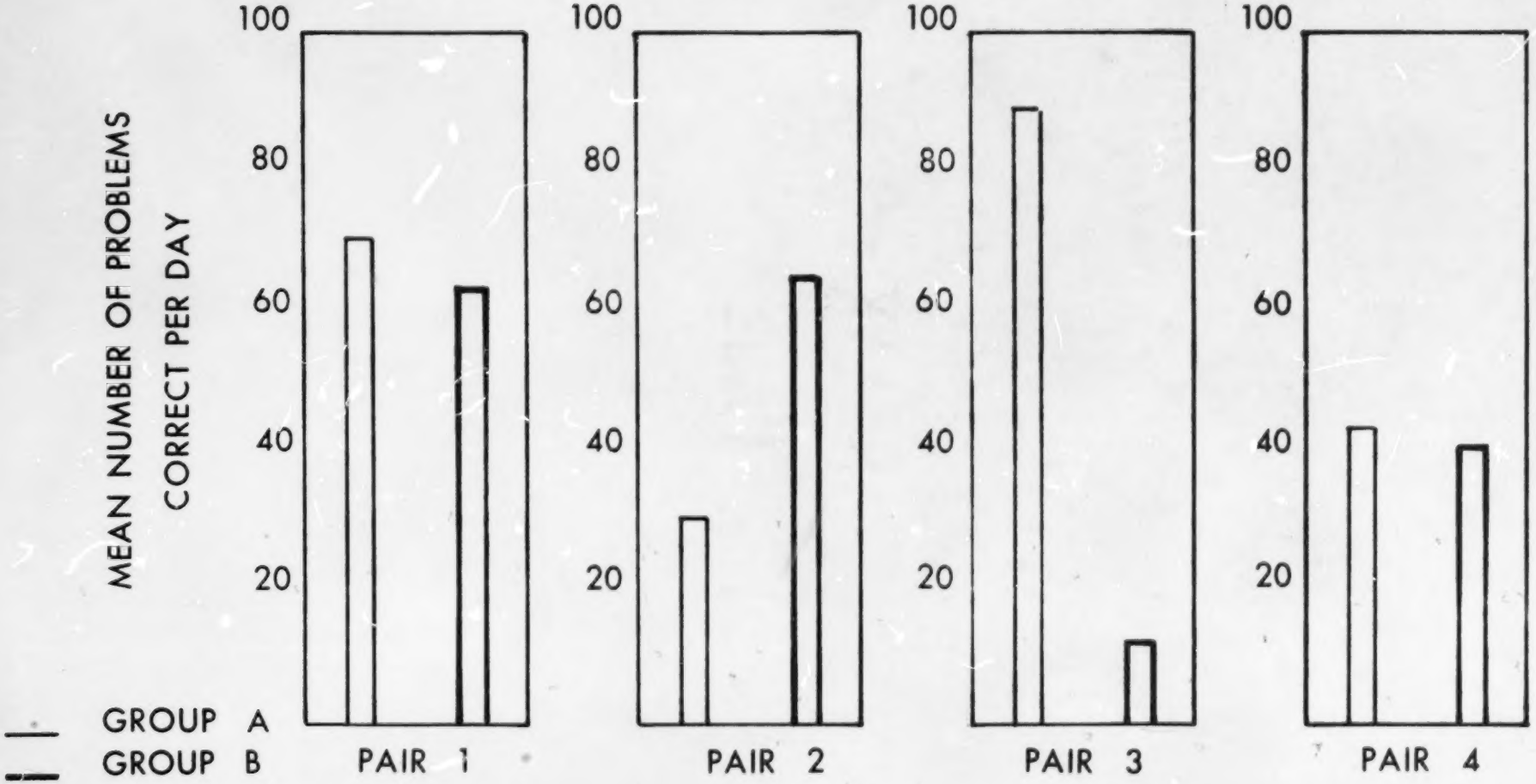

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Figure 1b

Phase I - Cubicle Study (Group A in Cubicles)

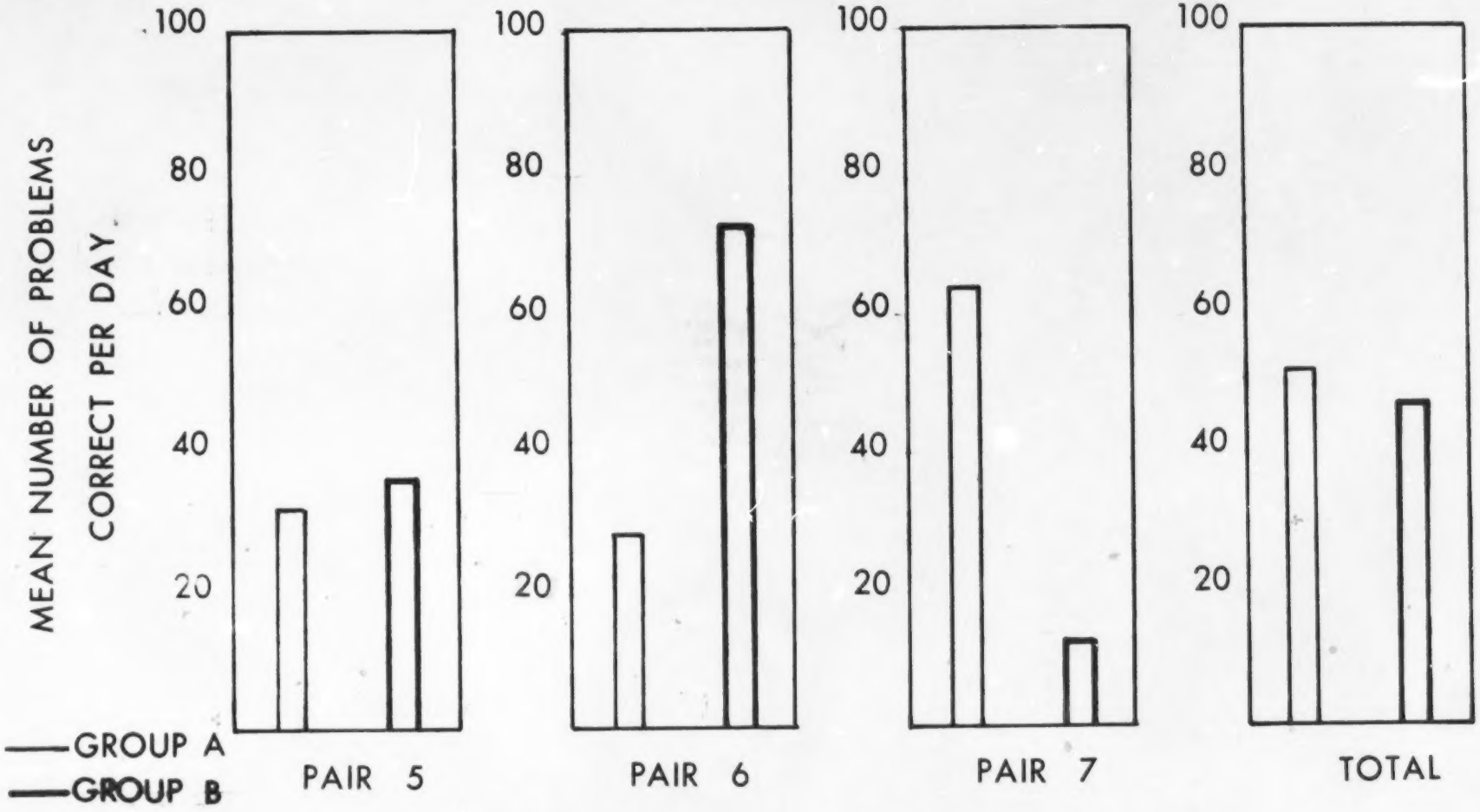

Figure 2a

Phase I - Cubicle Study (Group A in Cubicles)

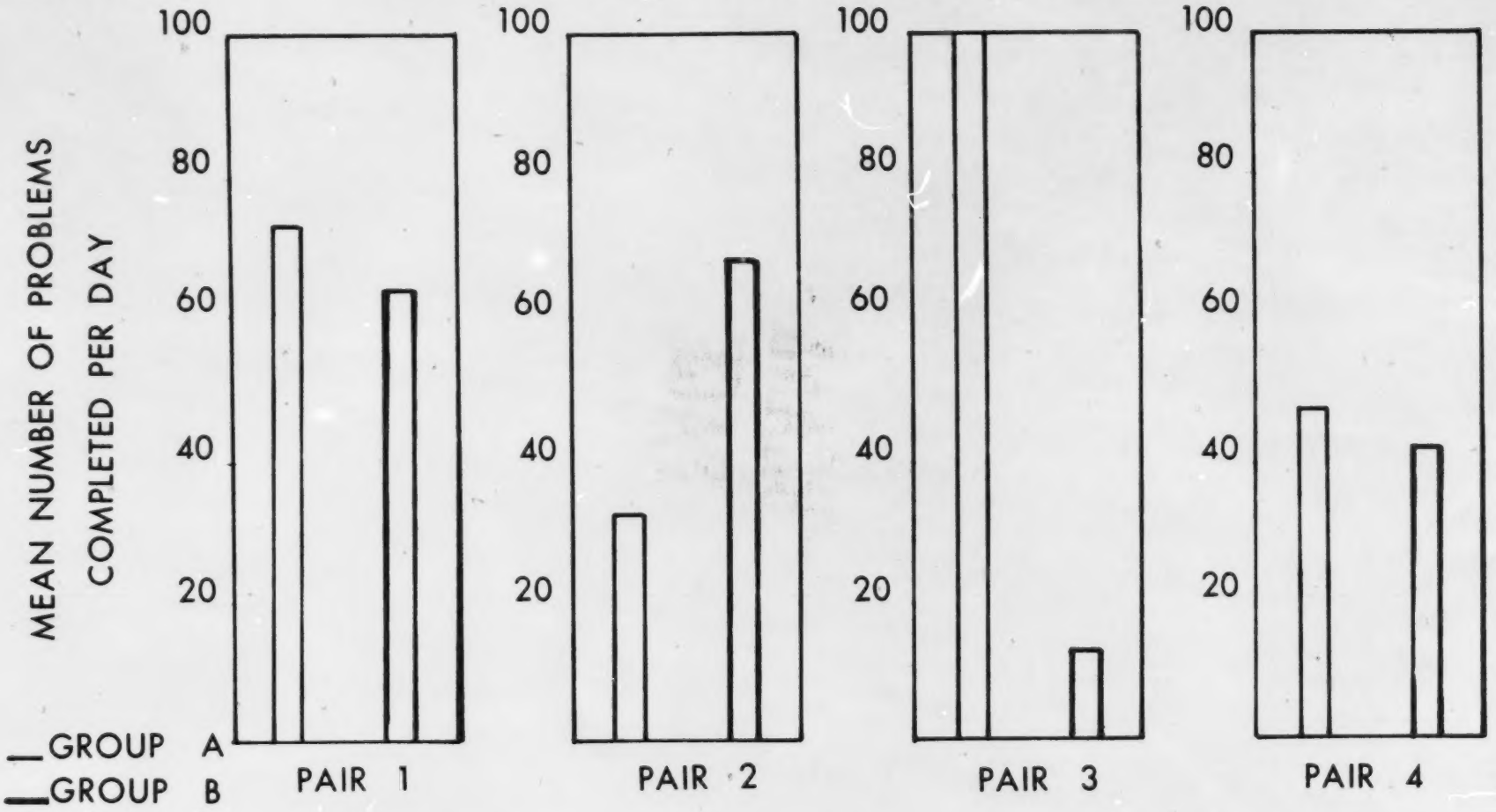

Figure 2b

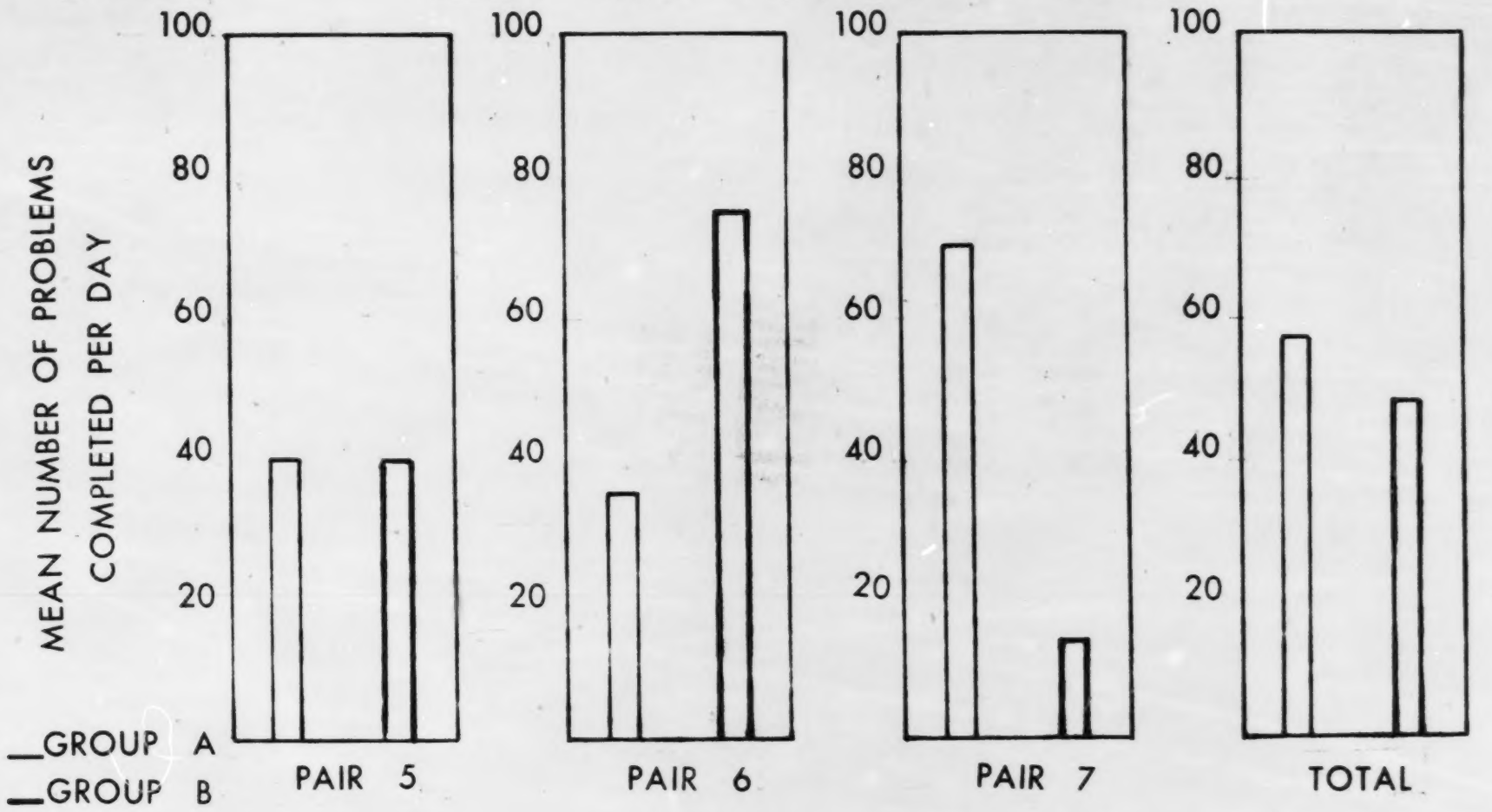
Phase I - Cubicle Study (Group A in Cubicles)
MEAN NUMBER OF PROBLEMS COMPLETED PER DAY
100
80
60
40
20
GROUP A
GROUP B
PAIR 5
PAIR 6
PAIR 7
TOTAL

Figure 3a

Phase II - Cubicle Study (Group B in Cubicles)

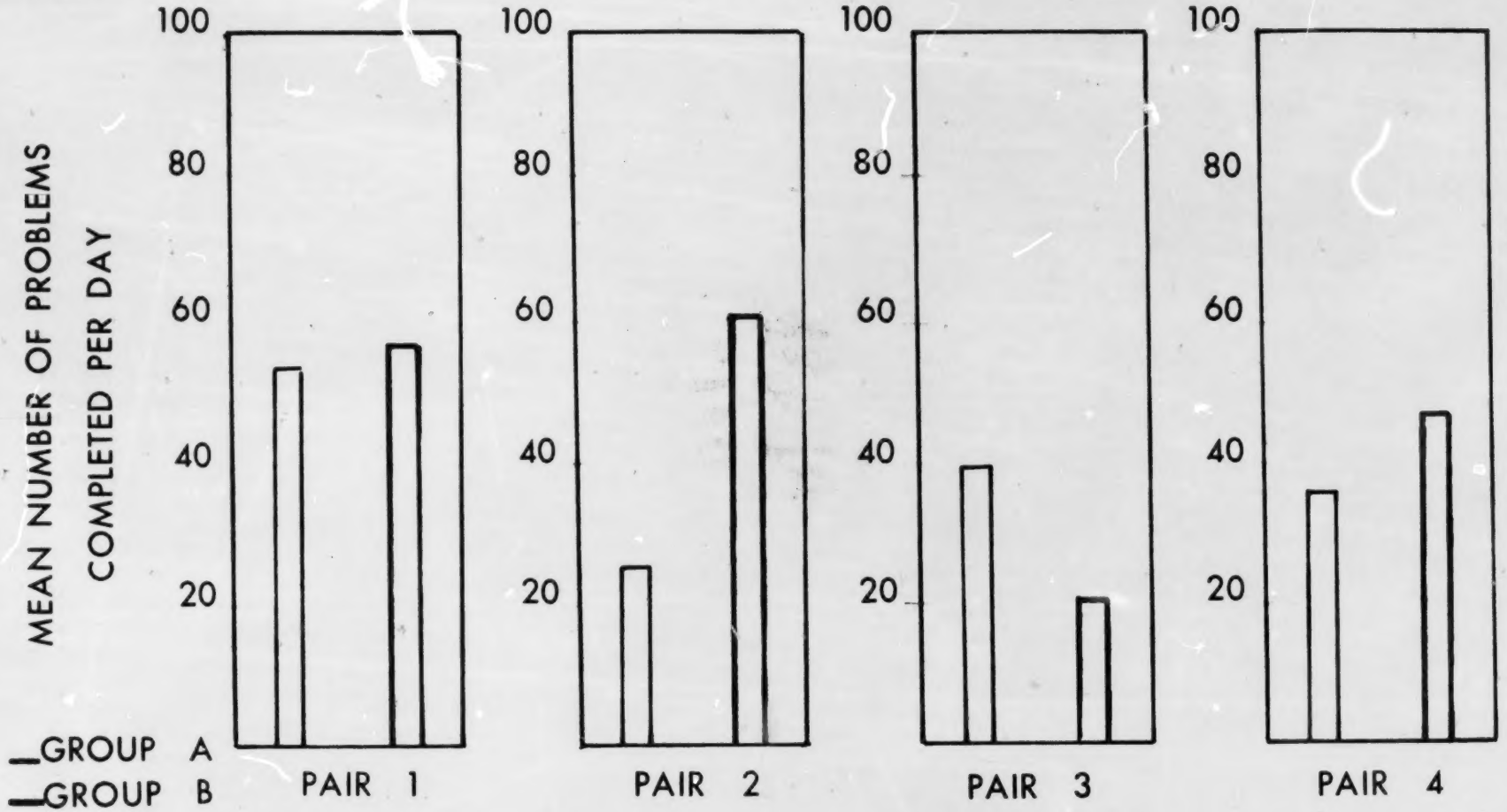

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Figure 3b

Phase II - Cubicle Study (Group B in Cubicles)

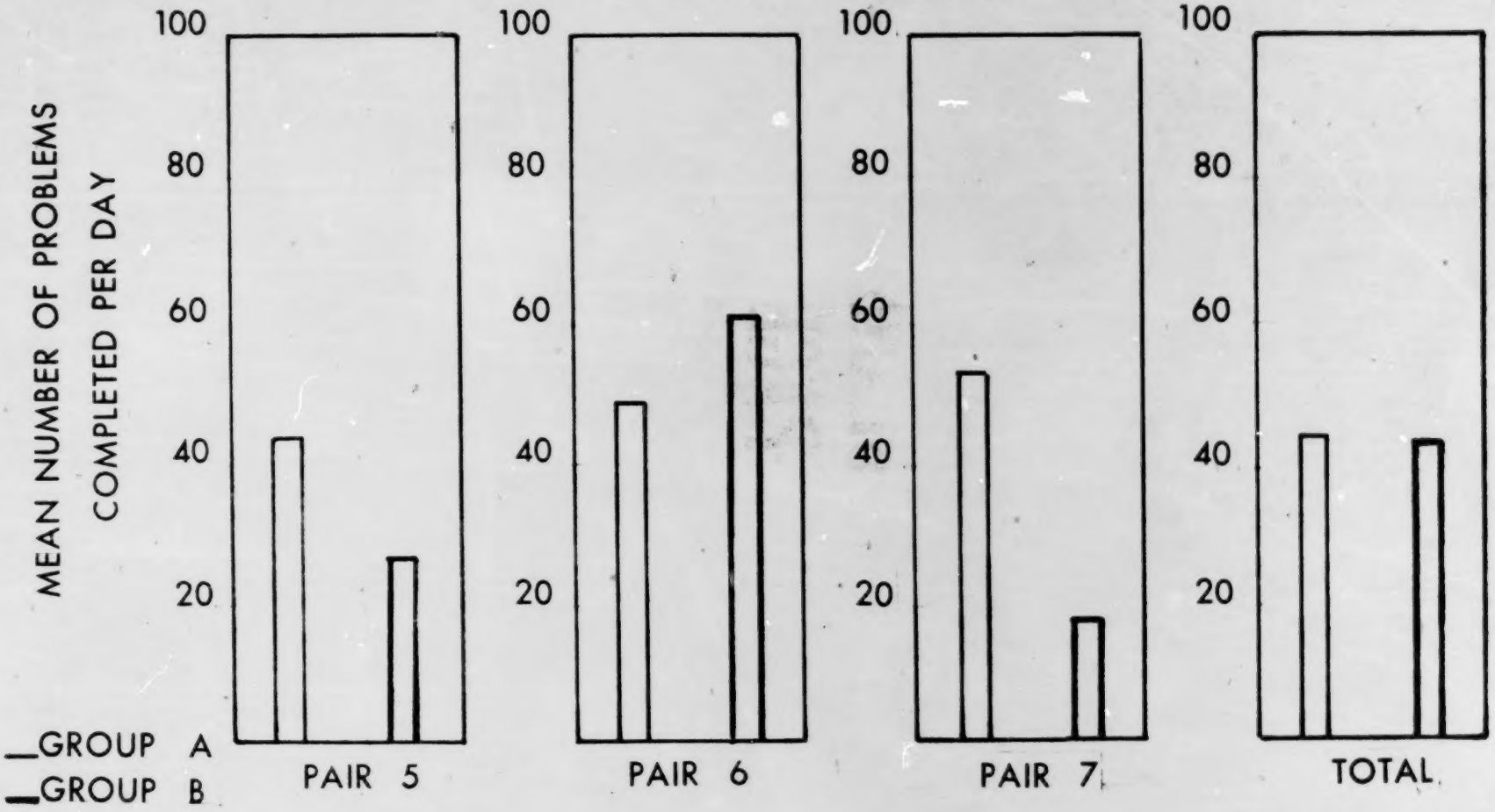

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Figure 4a

Phase II - Cubicle Study (Group B in Cubicles)

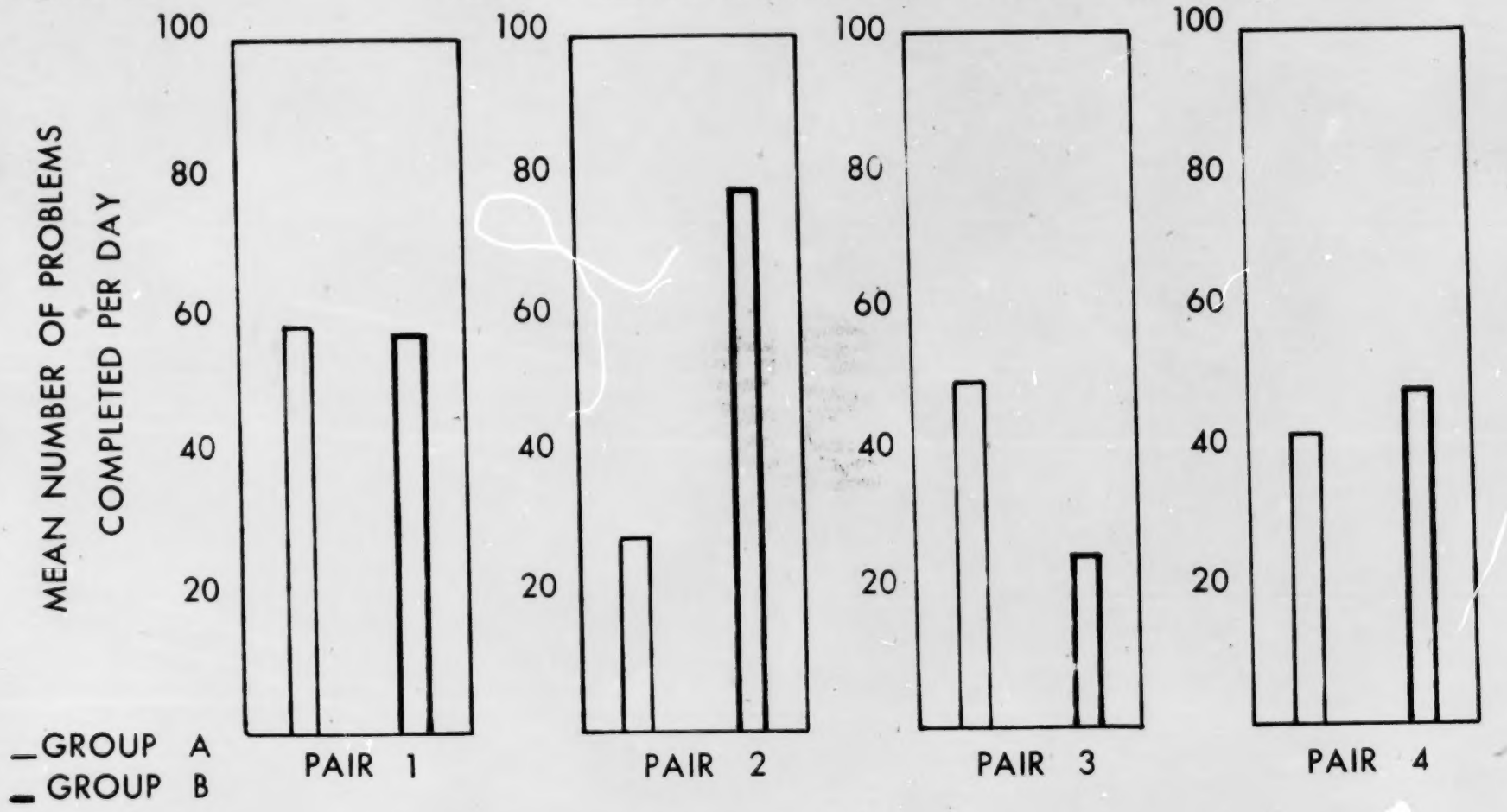
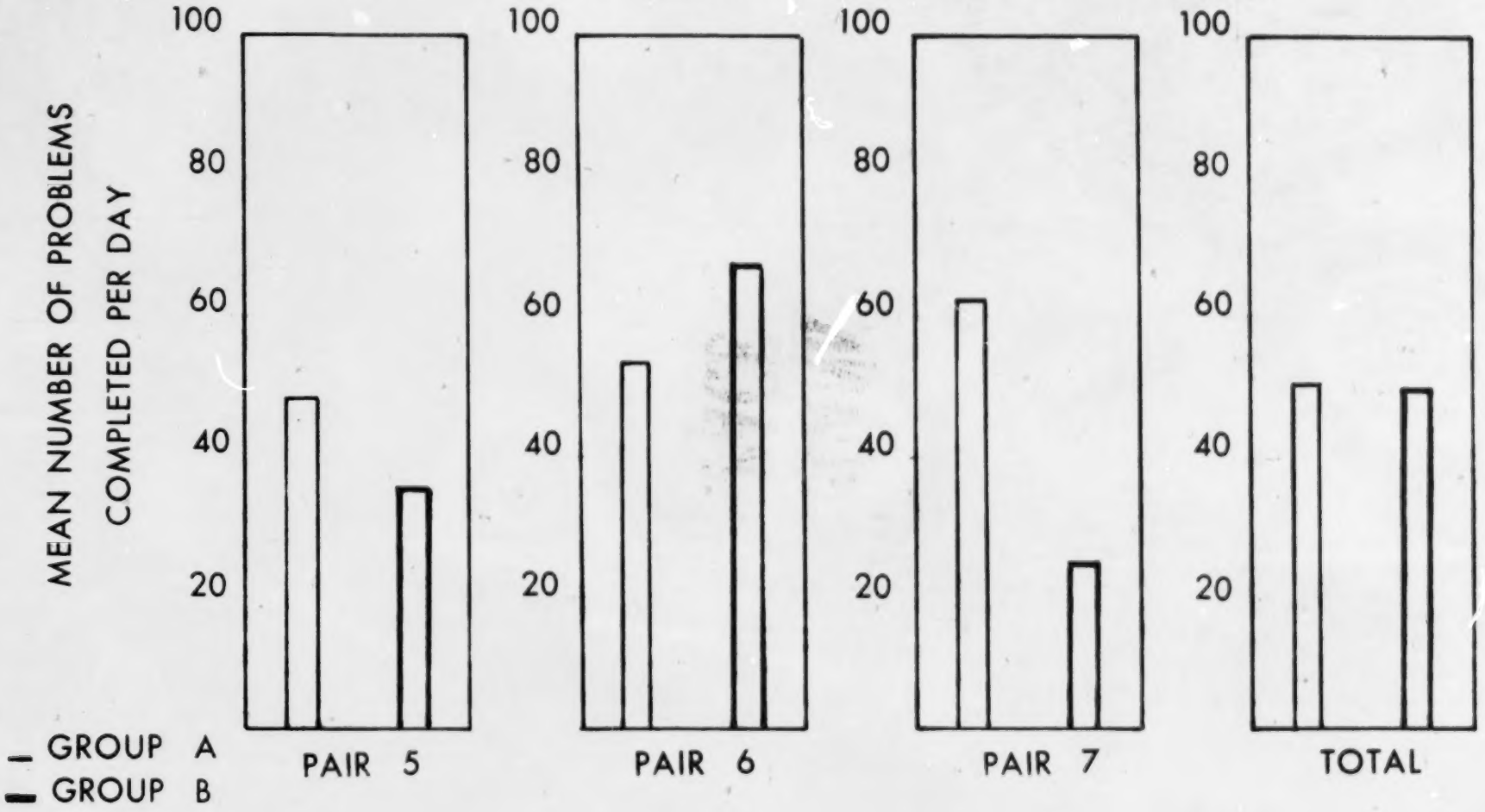


Figure 4b


Phase II - Cubicle Study (Group B in Cubicles)
MEAN NUMBER OF PROBLEMS COMPLETED PER DAY
100
80
60
40
20
PAIR 5
PAIR 6
PAIR 7
TOTAL
GROUP A
GROUP B

that he became discouraged.

Figures 5-8 present the average performance over days for each group on each of the performance measures. Note the higher performance of the study carrel group over the learning-center group during the first four days of Phase 1, and the subsequent merging of the performance curves. This phenomenon may be attributed to one or all of the following reasons:

(1) Although efforts had been made not to assign any special privilege to working in the carrels, the initial performance of Group A during Phase 1 may still have been due to the excitement and novelty of working in a private place. Graphs (Figs. 5-8) seem to support this conclusion, except that:

(2) The teacher became disturbed at the noise, chatting, and daydreaming occurring at the two learning-center tables. On the fifth day, the teacher began to give cues and praises to the entire class for quiet and quick work. Although this chatter and working with each other can be considered to be part of a learning-center the experimenter-teacher was instructed to teach this group as she would any other learning-center section. She was skillful in classroom management, and rapidly shaped the children into good work habits. Since the number of children sitting at the tables was small, the teacher had more control over the children than in the typical learning-center classroom. Nevertheless, it is remarkable to see that skillful behavioral management by the teacher provides as much structure for work behavior as do plywood boxes. The absolute barriers of the carrels produce no more nor less work behaviors than does the support and encouragement of the teacher.

We must bear in mind that this teacher was a well-established, and very popular authority over the children. She had a well over average level of management and teaching skills, but the learning-center group performed less diligently than the cubicle group before she instituted a conscious and

Figure 5

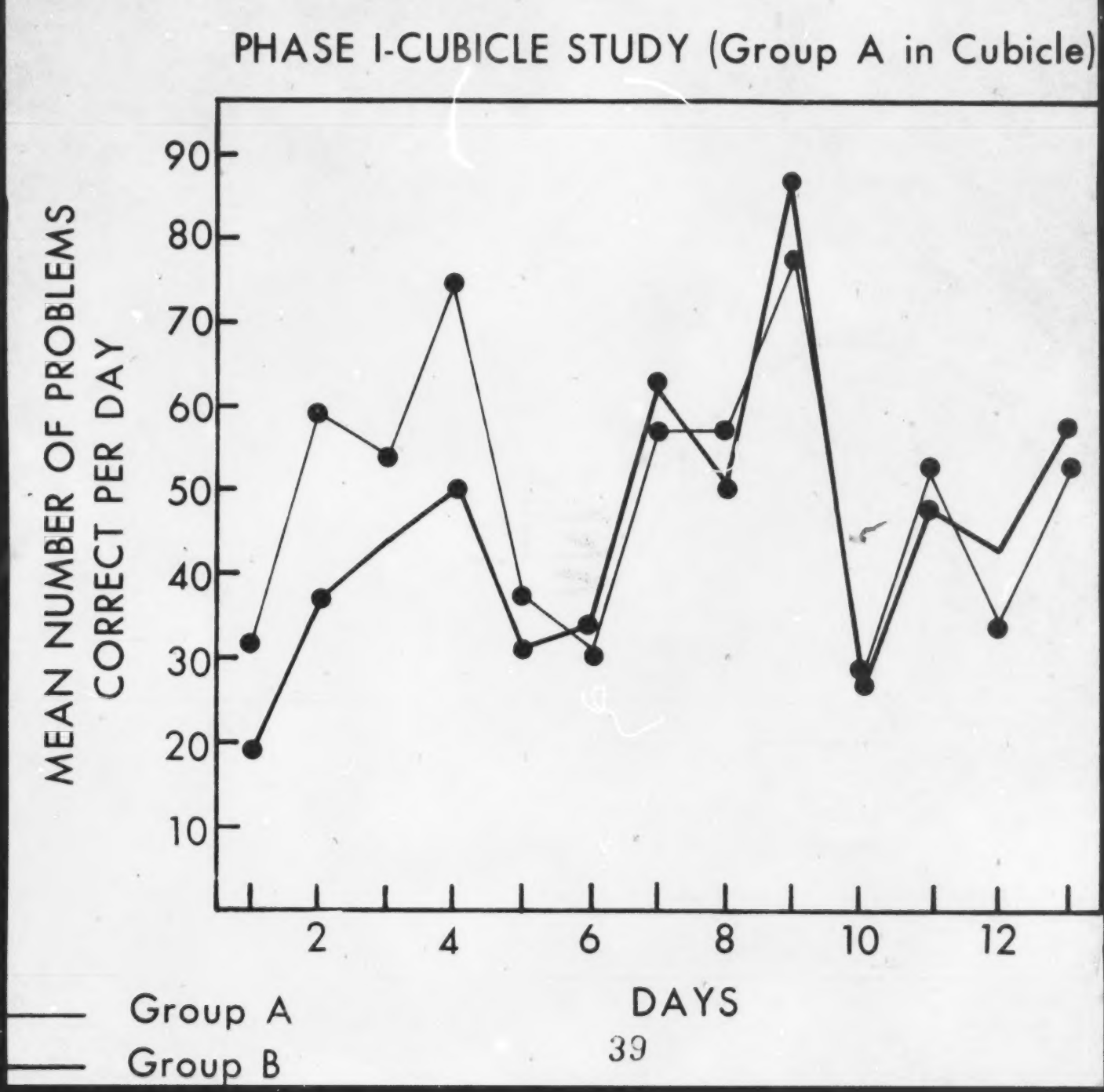

PHASE I-CUBICLE STUDY (Group A in Cubicle)
MEAN NUMBER OF PROBLEMS CORRECT PER DAY
90
80
70
60
50
40
30
20
10
2
4
6
8
10
12
DAYS
Group A
Group B

Figure 6

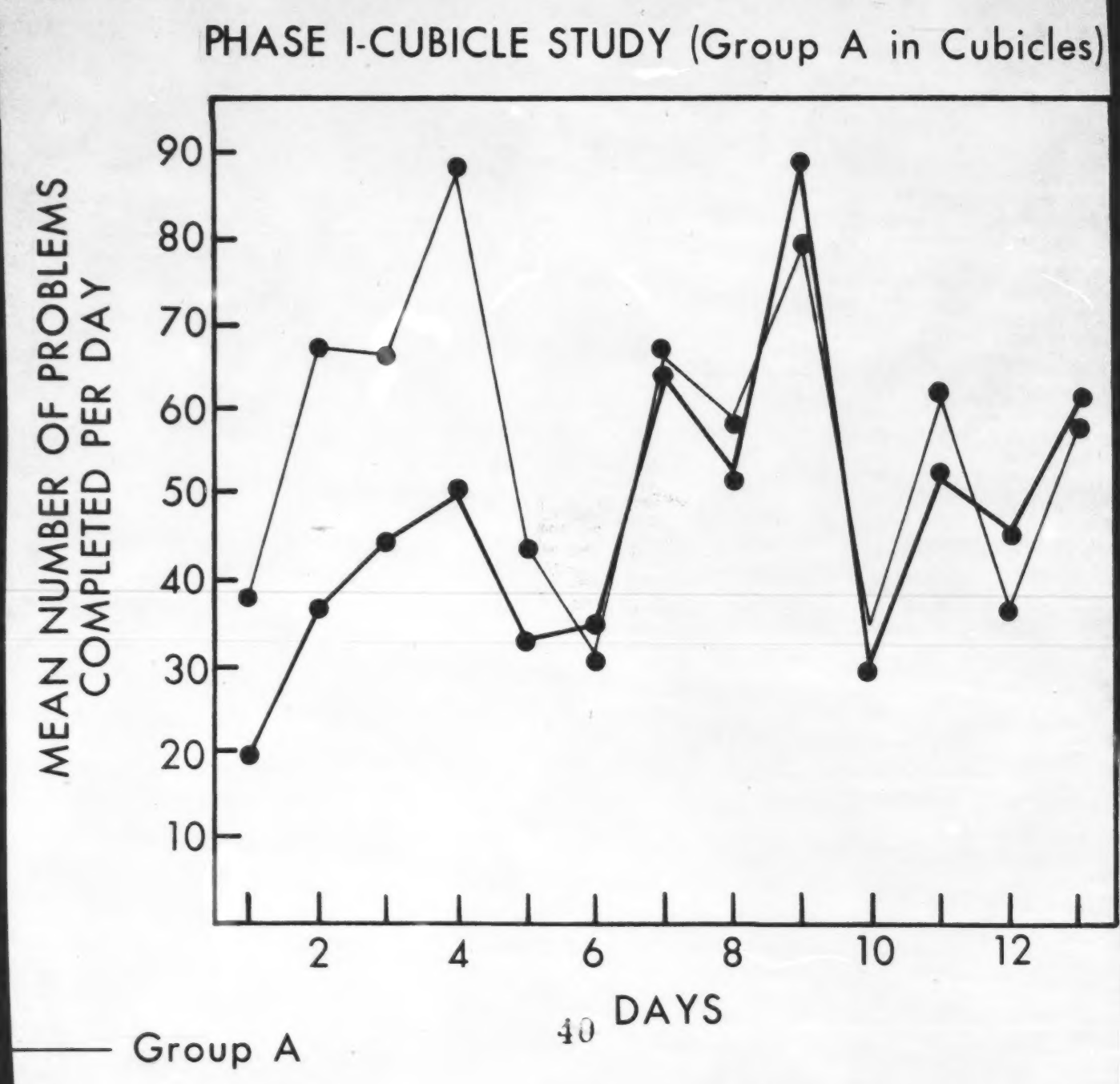

PHASE I-CUBICLE STUDY (Group A in Cubicles)
MEAN NUMBER OF PROBLEMS COMPLETED PER DAY
90
80
70
60
50
40
30
20
10
2
4
6
8
10
12
DAYS
Group A
Group B

Figure 7 Phase II - Cubicle Study (Group B in Cubicles)

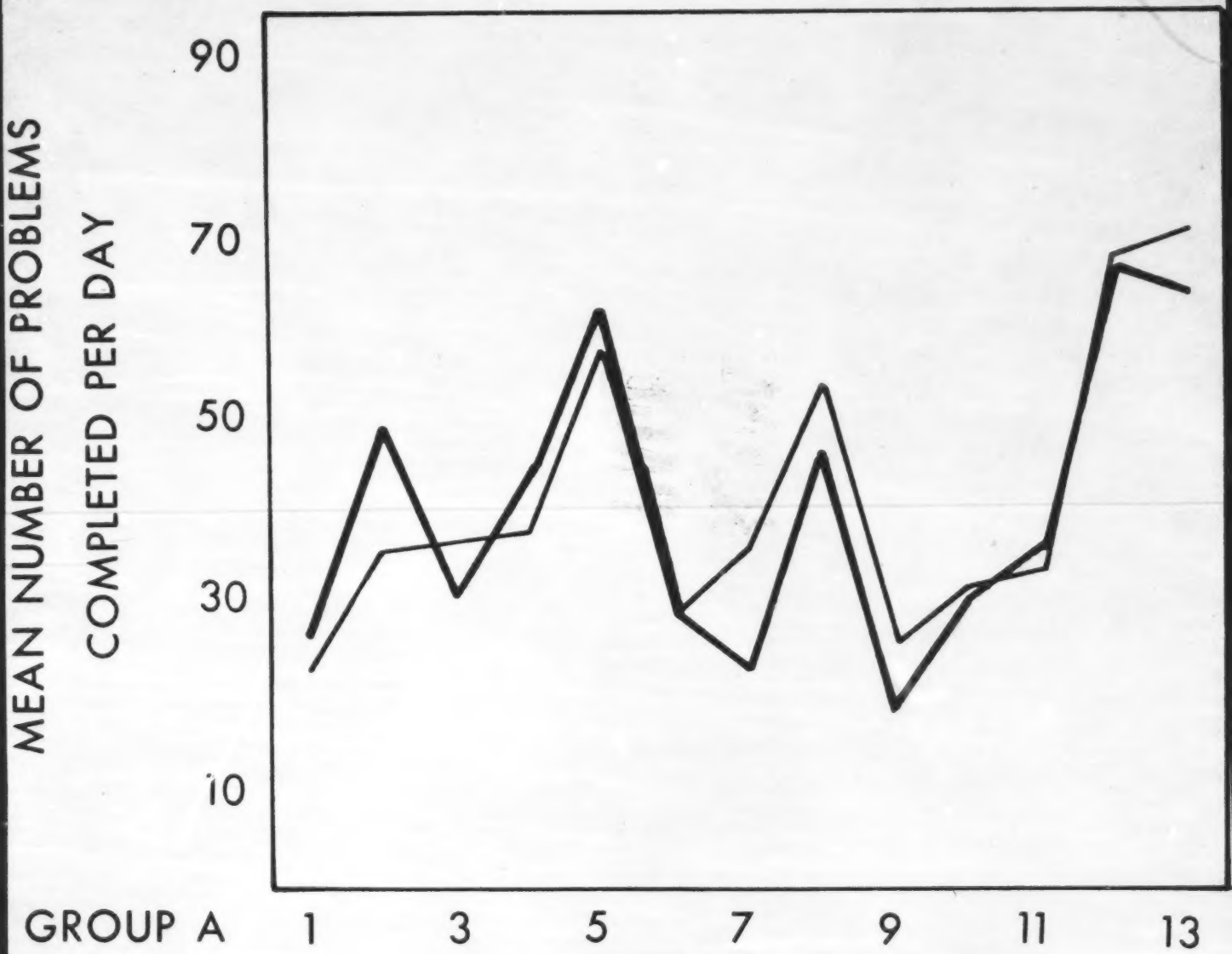
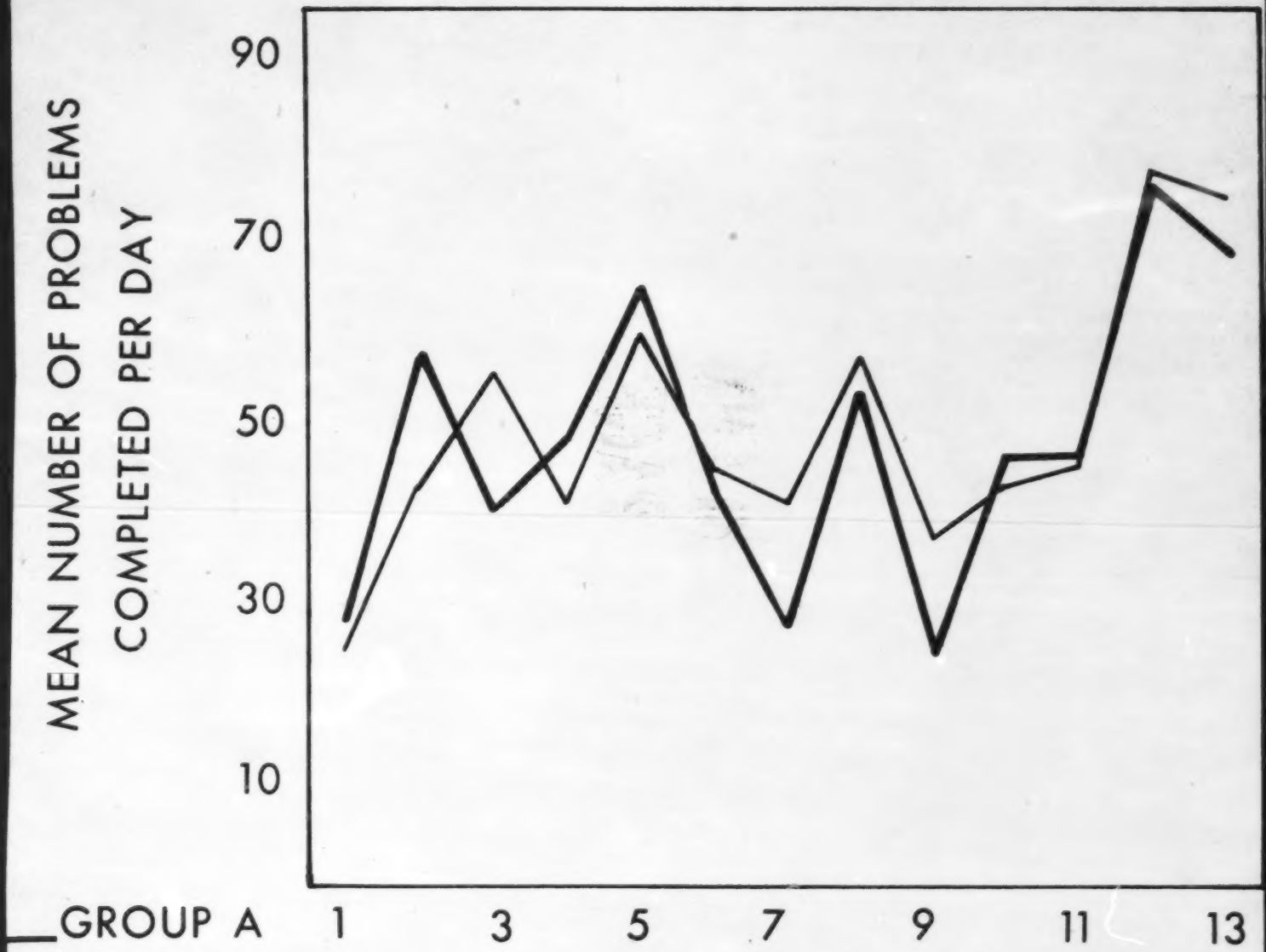


Figure 8 Phase II - Cubicle Study (Group B in Cubicles)



systematic use of behavioral shaping on Day 5. One might conclude that teachers lacking this kind of control may consider the use of a socially-restricted, cubicle-enivoronment to encourage the performance of drill exercises. On the other hand, the teacher with excellent skills can do as well with cueing and reinforcement as she can do with cubicles.

At least, she can do as well with a given number of children. We did not systematically increase the student numbers to see at what point her behavioral control would break down; this would be instructive only for this one teacher. Informal observation of her regular teaching, however, indicates that the at-work rate of her 28-pupil learning-center classroom is only or a little above the usual 25 percent.

For these conditions, however, the performance of both groups was astonishingly high. The average number of problems completed by a child in 20 minutes was about 50--quite an accomplishment for five-six year olds.

Conclusion

A socializing setting and a socially-restricted setting did not differ in either rate of work or in learning achievement, even for these sociable children, when excellent teacher control is present.

However, cubicles may be useful for drill work when there are too few teachers present in the classroom, or when management of the children is a problem for the teacher.